



Publisher

<http://jssidoi.org/esc/home>



THE LEGAL REGULATION OF FOOD WASTE IN POLAND AND LITHUANIA IN COMPLIANCE WITH EU DIRECTIVE 2018/851

Elżbieta Zębek ¹, Leda Žilinskienė ^{2*}

¹ *University of Warmia and Mazury in Olsztyn, Obitza 1, 10-725 Olsztyn, Poland*

² *Mykolas Romeris University, Ateities Str. 20, Vilnius, Lithuania*

Emails: elzbieta.zebek@uwm.edu.pl; ^{2*} lezilinskiene@stud.mruni.eu (Corresponding author)

Received 15 May 202; accepted 29 June 2021; published 30 September 2021

Abstract. Food waste is a global problem, one that has moved up the public and political agenda in recent years. Food is at the core of the United Nations' (UN) 'Sustainable Development Goals'. Food waste prevention is also highlighted as a priority area in the '2015 Circular Economy Package'. Food waste is an important indicator of sustainability because it embodies the sum of resources being used to produce uneaten food, and food waste disposal has an environmental, economic, and social impact. Directive 2018/851 established amendments to the food waste regulatory regime, including the definition of a food waste category and general provisions, which were related to food waste, providing a strong emphasis on waste prevention and the reporting of data in connection with food waste. New EU food waste rules should be implemented at the national level. Comparative research is needed for identifying any potential implementation problems. Such research will be carried out using case studies of Poland and Lithuania.

Keywords: food waste legal regulation; waste management; food waste; bio-waste, waste hierarchy

Reference to this paper should be made as follows: Zębek E., Žilinskienė L. 2021. The legal regulation of food waste in Poland and Lithuania in compliance with EU directive 2018/851. *Entrepreneurship and Sustainability Issues*, 9(1), 221-238. [http://doi.org/10.9770/jesi.2021.9.1\(13\)](http://doi.org/10.9770/jesi.2021.9.1(13))

JEL Classifications: Q01, Q56, K32

Additional disciplines: law

1. Introduction

Food waste is a global problem, one that has moved up the public and political agenda in recent years. Food waste is an important indicator of sustainability because it embodies the sum of resources being used to produce uneaten food, and food waste disposal has an environmental, economic, and social impact.

Various studies have shown that between a third and a half of the world's food production is not consumed, leading to the generation of negative impacts throughout the food supply chain, including in households (Bio Intelligence Service, 2011; Food and Agriculture Organization of the United Nations, 2017; Gustavsson et al., 2011, p. 4). While the food value chain is responsible for significant resource and environmental pressures, an estimated 20% of the total food produced is either lost or wasted in the EU (EC, 2015; Stenmarck et al., 2016). The EU food manufacturing sector and households alone waste about ninety million tonnes of food annually, or 180 kg per person, not taking into account losses in agriculture and fisheries (Bio Intelligence Service, 2011; EC, 2012; Stenmarck et al., 2016).

Food consumption and the generation of food waste are receiving increasing attention both at the global and EU levels. Global food production must increase by 70% by 2050 in order to meet the demands of the world's rapidly growing population levels (EC, 2012). Food has a vital importance as a resource given its intrinsic usage value for humanity as one of the few basic human needs.

Food is at the core of the United Nations' (UN) 'Sustainable Development Goals' (SDGs), which was released in 2015 as the UN's development agenda for the twenty-first century. The second and twelfth of the UN's seventeen SDGs are to '*End hunger, achieve food security and improved nutrition, and promote sustainable agriculture*', and to '*Ensure sustainable consumption and production patterns*' (United Nations, 2015). The later goal includes target 12.3: '*By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses*'. International attention on food waste has risen in recent years, as can be evidenced by its inclusion in the UN SDG, which has resulted in it making an impact on European policy in terms of food waste and food waste regulations.

Legislation is vital for important social issues to be addressed through law in a timely way (Scotford, 2021; Andryeyeva et al., 2021). Directive 2008/98/EC (hereinafter referred to as the 'waste framework directive', WFD) (EU, 2008), amended by Directive 2018/851 (EU, 2018, p. 851) established changes to the food waste regulatory regime, placing a far greater emphasis on waste prevention and reporting in detail regarding food waste. EU information regarding food waste is for the moment insufficient. The new waste legislation seeks to address this gap, as 'what is not measured cannot be managed'.

C. Bradshaw identifies problems with the key architecture of waste law applied to food waste, narrowing it to waste management problem rather than to problem of resource management (Bradshaw, 2018, p. 330). CJEU had regard to the obligation to interpret the concept of waste widely in order to limit its inherent risks and pollution (Van Calster, 2015, p. 21). It is becoming increasingly difficult to separate problems of environment, food safety, and public health (de Sadeleer, 2020). European waste law can be called an example of a set of deontic norms where factual uncertainty reigns (Post, 2016, p. 348).

Amendments at EU level did not formally affected EU waste hierarchy in relation to food waste, thought suggestions to expand current food waste hierarchy are presented (European Court of Auditors, 2016; Sanchez Lopez et al., 2020). Waste hierarchy is considered as one of most important concepts of waste management. Various assessments can be found in the available scientific literature: waste hierarchy is stated to be normative (Hultman & Corvellec, 2012, p. 2414), policy recommendation (Krämer, 2015, p. 361), or 'aprioristic hierarchy',

which means is only a starting point for analyses which must be carried out according to specific cases (Pope, 2020, p. 250). The limited character of the waste hierarchy is also observed (Van Ewijk & Stegemann, 2016, p. 127).

Emphasis on food waste prevention and data reporting systems should encourage further food waste research directions. Big data implementation in the sector of municipal waste management already gains scientific interest (Limba et al., 2020).

Food waste represents a unique opportunity to protect the economy, conserve natural resources, create jobs, and provide food to people who experience food insecurity, but legal requirements should be borne in mind. New EU food waste rules should be implemented at the national level, so state-of-the-art solutions should be analysed which will make it possible to achieve this goal in Poland and Lithuania.

2. Methodology

It has been hypothesised that changes to legal acts in Poland and Lithuania which regulate waste during the process of implementing the guidelines of the new ‘Waste Directive 2018/851’ may have contributed to an improvement in the general situation regarding food waste in both of those countries.

Considering this hypothesis, the following research questions have been formulated:

1. What are the effects of WFD implementation in EU member states, particularly in Poland and Lithuania?
2. What are the similarities between Poland and Lithuania in terms of their legal regulations regarding food waste?

The aim of this article is to divulge the main legal changes in food waste regulation at EU and national levels, particularly in Poland and Lithuania.

The aim of the article will be realised through the following objectives:

- To reveal a new food waste category and general provisions, which are related to food, waste within the waste framework directive, WFD.
- To disclose the main characteristics of these legal changes at both the EU and national levels (the latter regarding Poland and Lithuania specifically).
- Analyse and compare the legal and organisation-related solutions in terms of the management of food waste in Poland and Lithuania.

The research is based on legal dogmatic and comparative methods, including legal regulation analysis, document analysis, statistical data analysis, historical, linguistic, logical, and systematic analysis. The information for this paper was gathered according to the key words: food waste, waste management, waste hierarchy, municipal waste, and waste, using the methods of document analysis and statistical data. The authors relied on databases, such as those of the ‘Web of Science’ or Scopus, Eurostat, the United Nations, the European Environmental Agency, and the EU’s publications office, which provide quality data and information in terms of conducting research of this nature.

3. Rethinking the food waste problem: the circular economy

Food waste is a global problem, one that has moved up the public and political agenda in recent years. It took time to find acceptable solutions to the food waste problem at the EU level.

In order to be able to achieve the ambitious goal of reducing food waste, change is required across all stages of the food supply chain. This will include organisations, which are involved in agricultural production, food processing, transportation, and retail, including supermarkets and food service sectors, as well as individuals (Pearson & Perera, 2018, p. 47).

The implementation of the EU's circular economy concept had an important level of impact on the legal regulation of waste within the union. Food waste prevention is highlighted as a priority area in the '2015 Circular Economy Package'. A proposal for a directive by the European parliament and the council which amended Directive 2008/98/EC on waste (EC, 2015b) as part of a circular economy package suggested an amendment to EU waste legislation and set out new measures to promote food waste prevention, and food re-use.* The EU action plan for the circular economy set out the main measures in the food waste area:

- The development of a common methodology and indicators regarding the measurement of food waste;
- A stakeholder platform to examine how SDG goals regarding food waste can be achieved, along with the sharing of best practice and how progress may be evaluated;
- Clarify the relevant EU legislation where this may be related to waste, food, and feed, in order to facilitate food donations and the utilisation of former foodstuffs for animal feed;
- Explore options for the more effective use and understanding of date marking on food packaging.

A new circular economy action plan (EC, 2020), which presents a set of interrelated initiatives, will make it possible to establish a strong and coherent product policy framework which will make sustainable products, services, and business models the norm, and will serve to transform consumption patterns so that no waste is produced in the first place. The plan includes a sustainable product policy framework, key product value chains (including food, water, and nutrients), an enhanced waste policy, which supports waste prevention, the ideal of a circular economy, and other, related concepts. In the new circular economy action plan, it is stated that *'Commission will propose a target on food waste reduction, as a key action under the forthcoming EU Farm-to-Fork Strategy, which will address comprehensively the food value chain'*. The commission will also consider specific measures to increase the sustainability of food distribution and consumption. Under the sustainable products initiative, the commission will launch an analytical work to determine the scope of a legislative initiative on reuse in order to substitute single-use packaging, tableware, and cutlery by means of the supply of reusable products in food service areas. A new circular economy action plan shows that more improvement in food waste regulation can certainly be carried out.

A new regulatory regime for food waste was introduced in Directive 2018/851 (EU, 2018). This included new food waste definition and provisions to support food waste prevention. The new waste legislation seeks to address data gap as 'what is not measured cannot be managed'. This explains the need to develop of a common methodology and indicators to measure food waste, which are essentially important for further regulatory decisions.

One of the biggest obstacles when it comes to producing solutions for the problems regarding food waste is the lack of accurate data on food consumption and waste. Previous studies have revealed major data gaps in the available areas of knowledge regarding global food loss and waste (Gustavsson et al., 2011, p. 15), especially

* In general, within in the scope of the 'Circular Economy Package' proposals, six waste directives were drawn up.

with regard to the quantification of food losses through individual reasons, and the cost of preventing food waste. When the required information actually is available, it is often accompanied by major uncertainties. In EU-level food waste respects, methodological and data gaps have been identified through the European research project, FUSIONS (Møller et al., 2014, p. 32). Studies which have been conducted during the FUSIONS project served to propose a framework which could define food waste (Fusions, 2014), while proposing a methodology for measuring and monitoring volumes of food waste (Fusions, 2016).

The volumes, which are generated by the various sectors, tend to support results, which show that households are wasting the highest volumes of food. Food waste is therefore argued as not being a problem which can be linked to feckless consumerism at the household level, but one which is a side effect of a deeply-embedded failure to value food at a structural level (rather than an individual one) (Bradshaw, 2018, p. 312).

Food waste management does not work in isolation. The legal requirements for waste management must be taken into account. The main elements, which have some form of relevance when it comes to improving food and bio-waste managing in Europe, are as follows:

- The compulsory separate collection of bio-waste by 2023
- The overall recycling target for municipal waste of 65% by 2035 (besides the final recycling target for municipal solid waste, intermediate targets of 55% by 2025 and 60% by 2030 were also set).
- The exclusion in regards accounting for the mechanical biological treatment of municipal waste for recycling by 2027, and
- The 10% reduction target for municipal solid waste being sent to landfill by 2035.

The circular economy package has been a major driver in terms of resolving the general food waste problem, and for the first time food waste is gaining special recognition in terms of waste regulation at the EU level.

4. The concept of food waste within the ‘Waste Framework Directive’

The definition of food waste was set out in the directive, in Article 3(4a) of the WFD:

‘4a. “food waste” means all food as defined in Article 2 of Regulation (EC) No 178/2002 of the European Parliament and of the Council that has become waste’.

In defining food waste, this particular directive refers to Regulation (EC) No 178/2002 by the European parliament and of council (EU, 2002) which defines the concept of food in Article 2:

‘For the purposes of this Regulation, “food” (or “foodstuff”) means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans.

“Food” includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It includes water after the point of compliance as defined in Article 6 of Directive 98/83/EC and without prejudice to the requirements of Directives 80/778/EEC and 98/83/EC’.

The regulation also defines categories, which do not fall within the definition of food, and consequently cannot constitute food waste.

These definitions raise a question regarding what the relationship may be between the ‘waste’ and ‘food’ definitions. Food has special properties: it is very important and is different from other resources. Food is one of the few basic human needs, being different from many (though not all) resources in that it is a form of matter,

which is subject to decay. Legal acts, which govern food, acknowledge the nature of food in the respect that it tends to perish. *Food-related legal acts also prohibit the sale and donation of 'unsafe' food; that is, food which is 'injurious to health' or 'unfit for human consumption'. Food shall not be placed on the market if it is unsafe* (EU, 2002). EU law requires most pre-packed food to include either a date of expiration (a 'use by' date), which concerns food safety, or a date of minimum durability (a 'best before' date), which concerns food quality. To be able to value food as food, edibility is a key touchstone in determining when food should acceptably be removed from the food supply chain (Bradshaw, 2018, p. 325).

Decision 2019/1597 (EC, 2019a) provides an explanation, which states that the definition of 'food' as laid down in Regulation (EC) No 178/2002 encompasses food as a whole, along the *entire food supply chain* from production to consumption. Food also includes *inedible parts*, where these have not been separated from the edible parts when the food was being produced, such as bones, which are attached to meat that is destined for human consumption. Hence food waste can comprise items which include parts of food that are intended to be ingested and *parts of food that are not intended to be ingested*.

Food waste is defined as '*food [...] which has become waste*'. The WFD defines waste as 'any substance or object which the holder discards, or which they intend or are required to discard'. Under this definition 'food' should be regarded 'waste' at the point at which it is discarded. According to the courts, 'the scope of the meaning of "waste" depends upon the meaning of the verb "to discard"', and that verb must be interpreted in light of the aim of the directive, but 'no decisive criteria is, however, suggested by such a directive other than the holder's intention to or the action of discarding a given substance or object (CJEU, 2004, pp. 33–34).

The main properties of food, such as whether it is edible or safe to eat, do not count when defining food waste as they are not included in the definition of food waste. This means that the definition of food waste is somewhat wide and inclusive.

Food waste is subject to the basic provisions of legal acts, which cover food waste, which are set out in Decision 2019/1597 (EC, 2019a):

- Food waste does not include losses at stages of the food supply chain in which certain products have not yet become food as defined in Article 2 of Regulation (EC) No 178/2002, such as edible plants, which have not been harvested.
- In addition, the definition does not include by-products from the production of food, which fulfil the criteria set out in Article 5(1) of WFD, since such by-products are not classed as waste.

The properties and uses of the food make it possible to distinguish food waste as avoidable or non-avoidable (Bio Intelligence Service, 2008, p. 3). Legal regulations count food waste as a whole without any divisions into smaller categories, such as avoidable or unavoidable waste.

Food is a form of biodegradable waste or bio-waste. Directive 2018/851 supplemented the WFD with a definition of bio-waste:

'The term "bio-waste" refers to biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants'.

WFD Article 22 obliges member states to ensure that, by 31 December 2023, bio-waste is either separated and recycled at source, or is collected separately and is not mixed with other types of waste. Member states are to take measures in accordance with Articles 4 and 13, to: a) encourage the recycling, including composting and digestion, of bio-waste in such a way which fulfils the requisite high level of environmental protection and results in output which meets relevant high-quality standards; b) encourage home composting; and c) promotes the use of

materials which have been produced from bio-waste. WFD Article 11(6) states that, by 31 December 2024, the commission will consider [...] preparing for re-use targets for municipal waste and recycling targets for municipal bio-waste.

The definition of biodegradable waste in the ‘Landfill Directive’ (EU, 1999) has also remained unchanged. The term ‘biodegradable waste’ refers to any form of waste, which is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard. Under Article 5 of the directive, member states are to set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills, while the directive also sets out targets for the reduction of biodegradable municipal waste, which is going to landfills. The EU landfill directive obliges member states to reduce the amount of biodegradable waste going to landfill to 35% of 1995’s levels by 2020. Some EU member states have gone further by banning any food waste at all going to landfill (such as Germany, Austria, and Sweden).

The definition of food waste is somewhat wide and inclusive, so it raises questions if it sufficiently corresponds with the main features of food.

5. New provisions for food waste management in EU directives

Directive 2018/851 places a great deal of emphasis on the implementation of waste prevention, setting out *legally non-binding targets*:

1. Member states should take measures to promote prevention and prevent the generation of food waste in line with the ‘2030 Agenda for Sustainable Development’ and, in particular, in regard of its target of halving per capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains, including post-harvest losses, by 2030 (WFD Art 9 (1g)).
2. Member states should aim to achieve an indicative union-wide reduction in the food waste target of 30% by 2025, and 50% by 2030 (recital 31 in the preamble).

Directive 2018/851 outlines these main directions for the *implementation of food waste prevention*, which is to be carried out by member states:

1. Food waste prevention planning

- 1.1. Directive 2008/98/EC required member states to include food waste prevention in their waste prevention programs (Art 29 (2a)).

2. Informational measures about food waste

- 2.1. Member states should put in place specific measures to prevent food waste, including awareness-raising campaigns to show how to avoid food waste (recital 31 in the preamble).
- 2.2. Raising consumer awareness of what is meant by ‘use by’ and ‘best before’ dates (recital 32 in the preamble).

3. Actions to promote waste prevention

- 3.1. Encourage food donation and other forms of redistribution for human consumption, prioritising human use over animal feed and reprocessing into non-food products (WFD Art 9 (1h)).
- 3.2. Reduce the generation of food waste in primary production, in processing and manufacturing, in retail and other forms of food distribution, and in restaurants and food services, as well as in households (WFD Art 9 (1g)).
- 3.3. Member states should provide incentives for the collection of unsold food at all stages of the food supply chain and its safe distribution, including to charities (recital 32 in the preamble).
- 3.4. Annex IVa to the directive sets out an example of economic and other measures to promote the waste hierarchy which is referred to in Article 4 (3) in relation to the reduction of food waste: fiscal incentives for the donation of products, in particular food.

4. *Monitoring and the evaluation of waste prevention*

4.1. Member states will monitor and assess the implementation of their food waste prevention measures by measuring the levels of food waste on the basis of the methodology which has been established by the delegated act, as from the first full calendar year after the adoption of that delegated act (WFD Art 9 (5)). In this way, member states should also measure any progress, which is made in reducing food waste.

4.2. Member states are required to measure food waste in accordance with a common methodology, and to provide food waste data to the commission on an annual basis (WFD Art 9 (5), 37 (3), Preamble p 31).

4.3. The commission adopted delegated Decision (EU) 2019/1597 (EC, 2019a), establishing a common EU methodology to measure food waste. This decision separately measures the amount of food waste according to the stages of the food supply chain (primary production, processing and production, retail and other food distribution, restaurants and catering services, and households). The first compulsory reference year for reporting (the data and quality report) is the year 2020, which is to be reported before 30 June 2022.

4.4. The commission's Implementing Decision (EU) 2019/2000 (EU, 2019) lays down a format and quality check report for the reporting of data on the levels of food waste which is generated in member states.

4.5. The guidance primarily addresses the reporting of food waste and food surplus data collection, as well as the reporting of the applied methodology for data gathering and calculation (Eurostat, 2020, p. 3).

4.6. The setting of a quantified reduction of the food waste target at a European Union level will be decided on the basis of this information. To that end, the commission will submit a report to the European parliament and to the council, accompanied, if appropriate, by a legislative proposal.

6. **Food waste hierarchy and food waste prevention**

The waste hierarchy is the overarching principle of EU waste policies, which sets out a priority order: waste prevention is most desirable option, followed by preparing for re-use; recycling; other recovery, e.g. energy recovery; and disposal as the least desirable option (Figure 1).

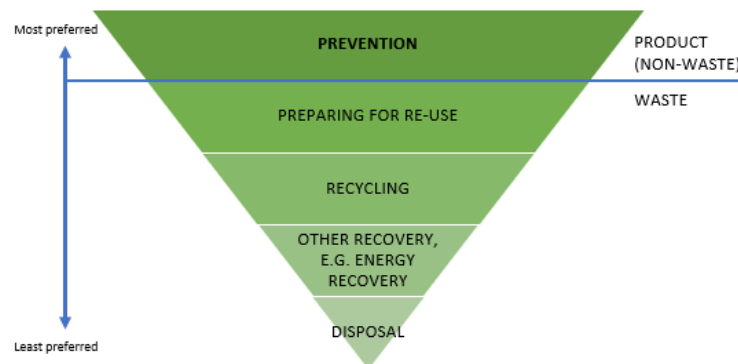


Figure 1. Waste hierarchy under the WFD.

In the recently-amended WFD, the definition of food waste and other provisions were introduced, but an amendment was not made to the existing EU waste hierarchy in relation to food waste. The commission does not consider it necessary to lay down a specific food waste hierarchy in EU waste legislation (European Court of Auditors, 2016, p. 57).

The question of waste hierarchy is not simple and straightforward. Therefore, various assessments can be found in the available scientific literature. Here it is stated that the waste hierarchy is normative because it determines the desirability of waste management practices (Hultman & Corvellec, 2012, p. 2414). Waste hierarchy is referred to

as an ‘aprioristic hierarchy’, which means that although the hierarchy must be seriously followed by member states in terms of waste management, it is only a starting point for analyses which must be carried out according to specific cases (Pope, 2020, p. 250). For example, the WFD allows specific waste streams to depart from the hierarchy where this is ‘justified by life-cycle thinking on the overall impacts of the generation and management of such waste’ (WFD Art 4 (2)). L Kramer therefore characterises the hierarchy as a policy recommendation (Krämer, 2015, p. 361).

The existing waste hierarchy is a solid strategy when it comes to avoiding the use of landfill sites, but doubts have been raised about the merits of the hierarchy with regard to minimising environmental impacts and the use of natural resources (Van Ewijk & Stegemann, 2016, p. 127). It has been stated that ‘policy implementation of the waste hierarchy has been limited mainly to the lower options’ (Van Ewijk & Stegemann, 2016, p. 127). Criticism of the waste hierarchy was initially directed at the fact that the measures, which involve reuse and recovery, although defined by the directive, did not serve as hierarchical levels of waste management (Pope, 2020, p. 251).

While food waste tells us about the difficulties within legal acts, which cover food waste, these difficulties, are exacerbated by the importance of food and its difference as a resource (Bradshaw, 2018, p. 312). The limited practical and legal utility of the waste hierarchy, together with the ‘waste as a resource’ approach it validates, adds to problems which surround food waste, rather than providing tools to disrupt them (Bradshaw, 2018, p. 323).

Inspired by the existing food waste hierarchies (*Wageningen University’s Ladder of Moerman, Food Waste Pyramid for London, OVAM’s (Public Waste Agency of Flanders) food waste hierarchy, FEVIA’s (Fédération de l’Industrie Alimentaire/Federatie Voedingsindustrie) food waste hierarchy and US Environmental Protection Agency’s food waste hierarchy*) it was observed in special report (European Court of Auditors, 2016, p. 10) that a hierarchy can be applied to food waste but should be slightly modified in order to take account of the particularities of food. It suggested a top three layers (prevention, donation, and animal feed) to be actions that can be taken before food constitutes waste, with those top three being the most preferable (Figure 2).

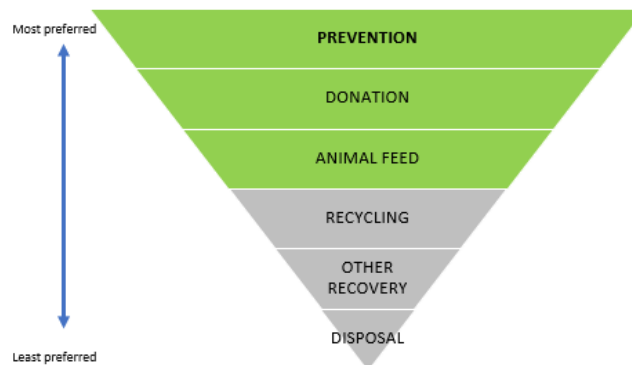


Figure 2. A food waste hierarchy as suggested in a special report (European Court of Auditors, 2016)

Other authors present a food surplus, by-products and food waste hierarchy as a prioritisation of the most preferable options: prevention, reuse (human consumption), reuse (animal feed), reuse in products and recycling food waste, recycling nutrient recovery, the recovery of energy, and disposal (Sanchez Lopez et al., 2020, p. 8) (Figure 3).

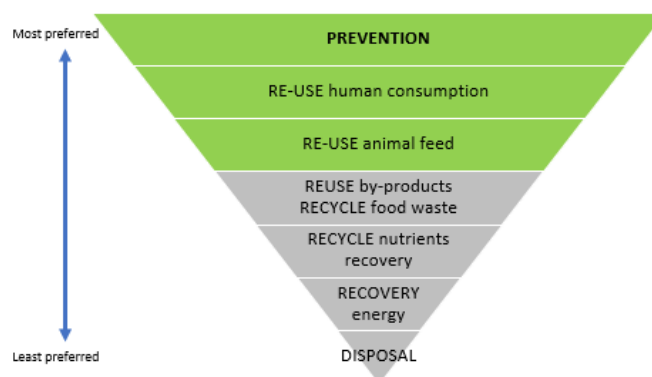


Figure 3. The food waste hierarchy model (Sanchez Lopez et al., 2020).

Although the WFD formally does not include a food waste hierarchy, it prioritises options within the waste prevention category: food donation and other forms of redistribution are both encouraged, along with prioritising human use over animal feed and reprocessing into non-food products (WFD Art 9 (1h)).

Waste prevention concerns what we do with ‘stuff’ before it becomes waste. Waste prevention actually has very little to do with waste so that, in turn, legal acts which cover food waste have a limited role in preventing waste (Scotford, 2008, p. 75). In defining ‘prevention’ as a measure, which is designed to reduce the quantity of waste, the directive demonstrates that its primary focus is on reduction rather than prevention (Pope, 2020, p. 251). According to the directive’s definition of waste, it is clear that products, which are in perfect conditions in terms of use, may be considered as being waste as long as the holder plans to get rid of them, even if they may be reused.

The action of food donation expresses a reuse of food, being a form of waste prevention measure. The main difference between preparing for reuse and actual reuse is that, in the case of the latter, the material has not yet become waste. At the level of the different EU policy areas, there are still a number of barriers which stand in the way of donation, such as a lack of clarity in existing legal provisions, missing legal provisions, or legal provisions which are not used in practice. As was noticed in a special report by European Court of Auditors (European Court of Auditors, 2016, p. 39), EU texts do not clarify whether donated food should be counted as wasted food or, on the contrary, whether a donation should be considered as a way of preventing food from being wasted.

If wastage in terms of food is not prevented, further food waste treatment options should be enacted. The acts of preparing for reuse, recycling, and other recovery options are sub-categories of the overarching concept of recovery. As noted in Article 22 of the WFD, priority is given in the following areas: a) to encourage the recycling, including composting and digestion, of bio-waste in a way which fulfils a high level of environment protection and results in output which meets relevant high-quality standards; b) to encourage home composting; and c) to promote the use of materials which have been produced from bio-waste.

Composting is an aerobic process, which decomposes organic material into a nutrient-rich soil conditioner. Types of compost formation include garden or on-site composting, vermi-composting, aerated windrow composting, aerated static pile composting, and in-vessel composting (IVC).

Anaerobic treatment (or **anaerobic digestion** (AD)) is seen as another option for food waste treatment. The treatment of biodegradable waste by means of controlled AD is used to transform the organic matter which is

contained in the waste into biogas and digestate. The production of biogas through controlled anaerobic digestion is one of the principal advantages of the process: it is a renewable energy source, which can be used in the production of electricity, heating, and fuel (whether gaseous or liquefied) (Pinasseau et al., 2018, p. 351).

Economically speaking, anaerobic digestion is very expensive and needs subsidies and a constant waste supply to be efficient. Some others advance environmental concerns, such as the emission of GHGs, and fear that the promotion of anaerobic digestion will divert attention from recycling being included in the overall waste hierarchy (Food and Agriculture Organization of the United Nations, 2013, p. 89). AD subsidies create an artificial demand for food as a fuel, with which an already existing demand for redistributed food must then compete.

The goal behind keeping food in the food supply chain must therefore be balanced with ensuring that wasted food is kept out of landfill (Bradshaw, 2018, p. 316). Food, like other biodegradable materials, releases climate-change gasses when it is sent to **landfill**. The amount of degradable organic matter within food waste is much higher than in average municipal solid waste, which contains only minimal levels of organic material. In other words, under the same conditions, 1kg of food waste will generate more methane (CH₄) than 1kg of average municipal solid waste (Food and Agriculture Organization of the United Nations, 2013, p. 87). Methane emissions from landfill represent the largest source of GHG emissions from the waste sector, contributing around 700Mt CO₂ eq (UNEP, 2010). At the global level, the environmental impact of incineration is relatively minor when it is compared to the impact of sending waste to landfill sites, as it contributes around 40Mt CO₂ eq (Food and Agriculture Organization of the United Nations, 2013, p. 87).

A specific food waste hierarchy is not laid down in EU waste legislation. The first option is to keep food in the food supply chain by means of prevention, and to balance other waste hierarchy options to ensure that wasted food is kept out of landfill. Due to waste hierarchy limitations, implementing more sustainable options rather than less presentable ones is somewhat impractical.

7. The legal regulation of food waste in Poland and Lithuania: a comparative analysis

In 2018, a total of 30% of the total volume of municipal waste generated in the European Union was recycled, while 28% was thermally disposed, 23% was rendered harmless by having it sent to landfill sites, and 17% was composted. In Poland, the proportion of deposited municipal waste was 76%, with 15% recycled and 8% composted in 2009 at the average level amongst EU countries (Zębek et al., 2015). This situation changed in 2019. At that time, biodegradable waste among municipal waste such as food and garden waste account for 28.9% of the total. An increase in the composting of municipal waste was observed, at a level of 9%, while the figure for waste, which had been sent to landfill sites, was at 42% (GUS, 2020). Moreover, in the years 2004-2014, the share of biologically processed municipal waste increased from 2.39% to 11.17% (GUS, 2005-2015). These values are slightly lower than the EU average.

The principles of municipal waste management in Poland are regulated in the 'Waste Act of 2012' (PLW), and the 'Cleanliness and Order Maintenance Act of 1996' (PLCOM). A definition of food waste has not yet been introduced in Poland, while the definitions of bio-waste and biodegradable waste have been implemented from the WFD 2008/98/EC. According to Article 3 (1) Point 1, bio-waste refers to biodegradable garden waste and parks, food and kitchen waste from households, as well as gastronomy outlets, mass caterers, retail units, and also comparable waste from facilities which are producing or introducing food marketing. However, biodegradable waste means waste that undergoes aerobic or anaerobic decomposition with the participation of micro-organisms (Article 3 (1) Point 10). The appropriate method of managing biodegradable waste is the R3 method, which is included in Annexe 1 to the act on waste, which consists of the recovery of organic substances, including composting and other biological transformation processes (Danecka and Radecki, 2020).

The communes are obliged to limit the volume of biodegradable municipal waste, which is sent to landfill by 16 June 1020 to no more than 35% of total municipal waste (Art 3c PLCOM). In 2013 and 2014, these levels were achieved (GUS, 2015). In order to achieve this level, the separate collection was introduced for biodegradable waste at the source. Previously, biodegradable waste was processed in the organic recycling-composting facility in 'Regional Municipal Waste Treatment Plants'. These were comprehensive municipal waste treatment plants, which were regulated by Art 35, which must meet the criteria for accepting waste from an area which is inhabited by at least 120,000 people, but were also guided by BAT requirements, regulating the mechanical and biological treatment of mixed municipal waste for recovery, waste incineration, and the storage of materials which are unsuitable for recovery. In 2020 these regulations were changed, with composting which was not already covered by the activities of the municipal installation with waste incineration processes and the number of people being covered by these installations likewise being eliminated (Article 35 PLW). Waste management plans are developed in order to achieve the goals, which were set out in the environmental protection policy along with the decoupling of the trend of increasing the volume of waste which is generated from the country's economic growth tendency - plus its impact upon the environment, and the implementation of the hierarchy of ways in which waste is managed along with the principles of self-sufficiency and proximity, and also establishing and maintaining an integrated and sufficient network of installations in the country's waste management processes which serves to meet the requirements of environmental protection policies (Article 34 PLW). Waste management plans should define a waste management policy, together with the planned usage of technology and processing methods, or they should propose policies, which regulate waste-causing problems in waste management. In addition, measures should be applied to encourage the separate collection of bio-waste for this purpose, composting and obtaining fermented biomass from such waste. Processing bio-waste should be conducted in such a way, which ensures a high level of environmental protection, along with the use of environmentally safe materials, which have been produced from bio-waste whilst maintaining a high level of protection for human life and health and the environment. According to Article 35 (1), in Poland, the 'National Waste Management Plan 2022' currently remains in force. The plan sets out guidelines covering municipal waste, especially food waste, at different stages of the product life cycle. In this regard, the following activities may be used in gastronomy-related situations, including workplaces, schools, and hospitals: a) education in the field of food waste; b) an introduction of different sizes of food portions, and the promotion of local and seasonal products; c) the early selection of a menu in the case of groups; and d) handing over to those in need of unused and good quality food.

In Poland, legislative work is underway on the draft act which serves to amend the act which regulates waste, resulting from the necessity transposition into Polish law of Directive 2018/851. The planned solutions in connection with the draft act on food waste consist of making changes to the definitions of bio-waste, waste management, waste prevention, and municipal waste, establishing new requirements in the field of waste prevention, extending the provisions on the scope of waste management plans, introducing targets for reducing the amount of waste which is sent to landfill, and specifying the date of their achievement, as well as imposing penalties for failures to achieve these targets. The planned date for the project's adoption by the council of ministers is the first quarter of 2021 (The Council of Ministers, 2021). The biggest challenge in the near future is the further development of the separate collection system for municipal waste in the country, which will ensure the acquisition of recyclable waste, and the development of bio-waste processing installations. Detailed changes in the act on waste concern Art 3 of the 'Waste Act', new definitions will be added and some existing definitions will be amended. The definition of bio-waste will be changed to ensure compliance with Directive (EU) 2018/851, with it now being classified as biodegradable waste from gardens and parks, and food and kitchen waste from households, gastronomy outlets, offices, restaurants, wholesalers, canteens, mass caterers, retail units, as well as comparable waste from establishments, which are producing or marketing food. In Art 3, Point 13a will be added with the definition of food waste, which covers any food as defined in Art 2 of Regulation (EC) No 178/2002, which has become waste. Due to the requirements of Directive 2018/851 regarding the development by member states of special programmes for the prevention of food waste, Art 34a (2) will contain an obligation to

develop a separate food waste prevention programme. Additionally, Art 34a (5 and 6) has clarified the requirement that national and regional food waste prevention programmes will form separate parts of these programmes within the field of waste prevention (Sejm materials, 2020).

Lithuania has achieved significant progress regarding waste management, as it has halved its rate of use of landfill sites since 2014, down to 33%. Recycling and composting (48%) have become the main treatment options, slightly above the EU average of around 46%. This development is in large part due to the increase in composting, up to 24%, an almost 150% increase since 2014, which ranks Lithuania as one of the top performers in the EU (which has an average composting rate across the EU of about 17%) (EC, 2019b, p. 6). The increase in composting is due to the opening up of green waste composting sites, to which members of the public can bring garden waste and similar waste, free of charge (EC, 2019b, p. 7).

The republic of Lithuania's 'Law on Waste Management' (LLWM) does not provide a definition of food waste. This law defines biodegradable waste as any waste, which is capable of undergoing, or may be subjected to, anaerobic or aerobic decomposition.

LLWM Article 26(4) requires that the 'National Plan for Waste Management' must provide goals and targets in respect of the reduction of the volume of biodegradable waste, which is sent to landfill. Municipalities must ensure that each municipality and municipal waste management region provide conditions for the treatment of municipal biodegradable waste (for compost and/or anaerobic digestion (LLWM 30(17))).

Lithuanian waste management rules (Minister of environment of the Republic of Lithuania, 1999) lay down provisions for economic operators: hotels, restaurants, and other public catering establishments, along with food production and trade enterprises, requiring them to sort bio-waste at the place of its generation, and not mix it with other waste, as well as ensuring that it is not contaminated with hazardous substances (p. 60).

Waste management rules state that municipalities must ensure the sorting of household food and kitchen waste at the point of generation, and that they are required to set up sorting in cities which have a population of over 50,000 inhabitants, while ensuring the sorting of household food and kitchen waste on-site and setting up sorting in other areas in which the sorting of food and kitchen waste is economically viable or technically possible. Municipalities must provide the general population with containers and ensure the temporary storage of this waste where it does not pose a risk to human health or the environment.

The 'National Plan for Waste Management' for 2014-2020 (Government of the Republic of Lithuania, 2002) sets out tasks for municipalities from 2019 to implement the separate collection of food or kitchen waste and install sufficient capacity to separately treat collected food or kitchen waste. Municipalities, which are using various waste collection methods and measures, must ensure that biodegradable waste (green waste and food or kitchen waste) is collected separately in municipal waste management systems, which are managed by them when sorting out waste at the place of its generation.

The Alytus district, the only one out of ten, implemented the 'National Plan for Waste Management' requirement for a separate food and kitchen waste collection by 2019 (Alytus Region Waste Management Center, 2020, p. 13). For example, food and kitchen waste is still not separately collected in the capital city of Vilnius or the majority of municipalities. As the 'National Plan for Waste Management' expired in 2020 and a new plan has not yet been approved, there is a need for clear provisions which cover the separate collection of food waste or bio-waste, as requirements for the separate collection of food waste have largely not been fulfilled.

In order to transpose the provisions of Directive 2018/851 into Lithuanian law, a draft of LLWM has been prepared (Lietuvos Respublikos Seimas, 2021). This draft includes a definition of food waste and a renewed definition of biowaste, focusing on the prevention of food wastage and its prevention.

When analysing the efficiency of processing bio-waste from municipal waste in the composting process, it should be stated that Lithuania has better results, which come in at the level of 17%, while in Poland the corresponding figure is 11%; nevertheless, these trends are increasing. When comparing legislative solutions, which are aimed at implementing the provisions of Directive 2018/851 in both countries, a definition of food waste has not yet been introduced. However, there are currently definitions available for bio-waste and biodegradable waste which have directly been implemented from Directive 2008/98/EC, and which contain references to food waste. Moreover, in both countries the regulations are observed where they cover the limitation of stored biodegradable waste in landfill sites. The appropriate method for managing this waste is composting, which is clearly indicated in the legal acts which cover management plans for food waste and municipal waste. In order to strengthen the safety of using this method, the obligation was introduced to selectively collect bio-waste (waste from food and gardens), and it was forbidden to mix such waste with other forms of waste (especially, clearly, in the LLWM), which could contaminate it with toxic components and disrupt the aerobic or anaerobic decomposition of organic matter with the participation of micro-organisms. In addition, this is the most effective method of bio-waste management (Zębek, 2018). Moreover, in Poland, legislative work is underway to introduce a definition of food waste into the Waste Act in order to give it the status of waste and impose greater obligations to limit its generation and ensure its proper management.

Conclusions

1. The circular economy package has been a major driver in terms of resolving the food waste problem. For the first time food waste is gaining special recognition in terms of waste regulation at the EU level. Directive 2018/851, which amends the ‘Waste Framework Directive’ introduced a new definition of food waste and provisions to support food waste prevention. Food waste prevention which is being carried out by member states include food waste prevention planning, informational measures regarding food waste, action plans to promote waste prevention, and the monitoring and evaluation of waste prevention (the data-reporting duty). The directive sets out legally non-binding targets. The definition of food waste is considered wide and inclusive, so it does raise questions regarding whether it sufficiently corresponds to the main features of food.
2. A specific food waste hierarchy has not been laid down in EU waste legislation. The first option in this regard is to keep food in the food supply chain by means of prevention, and to balance out other waste hierarchy options to ensure that wasted food is kept out of landfill. Due to waste hierarchy limitations, implementing more sustainable options rather than less sustainable ones is somewhat difficult.
3. As a result of the introduction of legal solutions in the field of bio-waste management in Poland and Lithuania, selective collection of this waste ‘at source’ has been introduced, and its composting process increases without it needing to be stored in landfill sites, which is in line both with the hierarchy of waste management methods and the applicable regulations on limiting and banning the use of landfill sites as a way of disposing of biodegradable municipal waste.
4. In both countries, the definition of food waste and detailed rules for limiting its production and management have not yet been introduced into legal acts, which cover food waste. However, current bio-waste legislation partially meets the requirements of Directive 2018/851. Currently, in both countries, i.e. Poland and Lithuania, legislative work is underway to implement the definition of food waste as a category of waste and to include it into the obligation to act as in the case of waste.

5. All of these legislative and organisational activities will contribute to increasing the regulation of the issue of food waste in Poland and Lithuania, which will reduce food waste and strengthen the regulation of food production by producers and consumers, which is the main idea of Directive 2018/851.

The novelty of the article is to analyse, in the context of sustainability and circular economy, new legislative changes adopted at EU level, which provide legal instruments to address the issue of food waste.

The article examines the legal measures for solving the problem of food waste, which can be beneficial for private and public sector entities implementing food waste prevention measures. The presented legal and organizational solutions in the field of food waste management in connection with the implementation of the Directive 2018/851 in Poland and Lithuania may be an example and guidance for other EU countries.

References

Alytus Region Waste Management Center. (2020). *Metinis pranešimas 2020 (Annual Report 2020)*. Retrieved June 1, 2021 from <https://www.aratc.lt/uploads/Veiklos%20ataskaitos/Metinis%20pranesimas%202020.pdf>

Andryeyeva, N., Nikishyna, O., Burkynskyi, B., Khumarova, N., Laiko, O., Tiutiunyk, H. (2021). Methodology of analysis of the influence of the economic policy of the state on the environment. *Insights into Regional Development*, 3(2), 198-212. [https://doi.org/10.9770/IRD.2021.3.2\(3\)](https://doi.org/10.9770/IRD.2021.3.2(3))

Bio Intelligence Service. (2008). *Guidelines on the preparation of food waste prevention programmes*. Retrieved June 1, 2021 from https://ec.europa.eu/food/sites/food/files/safety/docs/fw_lib_prevention_guidelines_en.pdf

Bio Intelligence Service. (2011). *Preparatory study on food waste across EU 27: Final report*. Publications Office. Retrieved June 1, 2021 from <https://data.europa.eu/doi/10.2779/85947>

Bradshaw, C. (2018). Waste Law and the Value of Food. *Journal of Environmental Law*, 30(2), 311–331. <https://doi.org/10.1093/jel/eqy009>

CJEU. (2004). *Antonio Niselli, case C-457/02*. Retrieved June 1, 2021 from <https://curia.europa.eu/juris/document/document.jsf?sessionId=FC4365C418509E1AB839582DF79C6391?text=&docid=49661&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=5773341>

Danecka, D., Radecki W., *Waste Act. Comment*, 5. Edition, Wolters Kluwer Polska, Warsaw 2020

EC. (2012). *Communication Innovating for Sustainable Growth: A Bioeconomy for Europe COM/2012/060 final*. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52012DC0060&from=LT>

EC. (2015). *Communication Closing the loop—An EU action plan for the Circular Economy*. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015DC0614&from=LT>

EC. (2019a). *Commission delegated decision (EU) 2019/1597 supplementing Directive 2008/98/EC of the European Parliament and of the Council as regards a common methodology and minimum quality requirements for the uniform measurement of levels of food waste*. OJ L 248/77. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019D1597&from=LT>

EC. (2019b). *The Environmental Implementation Review 2019: Country report Lithuania*. Retrieved June 1, 2021 from https://ec.europa.eu/environment/eir/pdf/report_lt_en.pdf

EC. (2020). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A new Circular Economy Action Plan For a cleaner and more competitive Europe*. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A98%3AFIN>

- EC. (2015b). *Proposal for a directive of European Parliament and of the Council amending Directive 2008/98/EC on waste*. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015PC0595>
- EU. (1999). *Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste*. OJ L 182, 16/07/1999 P. 0001-0019. Retrieved June 1, 2021 from <http://data.europa.eu/eli/dir/1999/31/oj/eng>
- EU. (2002). *Regulation (EC) No 178/2002 of the European Parliament and of the Council, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety*. OJ L 31, 1.2.2002, p. 1–24. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/eli/reg/2002/178/oj>
- EU. (2008). *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives*. OJ L 312, 22.11.2008, p. 3–30. Retrieved June 1, 2021 from <http://data.europa.eu/eli/dir/2008/98/oj/eng>
- EU. (2018). *Directive (EU) 2018/851 of the European Parliament and of the Council amending Directive 2008/98/EC on waste*. OJ L 150/109. Retrieved June 1, 2021 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L0851&from=LT>
- EU. (2019). *Commission Implementing Decision (EU) 2019/2000 of 28 November 2019 laying down a format for reporting of data on food waste and for submission of the quality check report in accordance with Directive 2008/98/EC of the European Parliament and of the Council*. OJ L 310, 2.12.2019, p. 39–45. Retrieved June 1, 2021 from http://data.europa.eu/eli/dec_impl/2019/2000/oj/eng
- European Court of Auditors. (2016). *Combating Food Waste: An opportunity for the EU to improve the resource-efficiency of the food supply chain*. Retrieved June 1, 2021 from https://www.eca.europa.eu/Lists/ECADocuments/SR16_34/SR_FOOD_WASTE_EN.pdf
- Eurostat. (2020). *Guidance on reporting of data on food waste and food waste prevention*. Retrieved June 1, 2021 from <https://ec.europa.eu/eurostat/documents/342366/351811/Guidance+on+food+waste+reporting/5581b0a2-b09e-adc0-4e0a-b20062dfe564>
- Food and Agriculture Organization of the United Nations (2013). *Toolkit: Reducing the food wastage footprint*. Retrieved June 1, 2021 from <http://www.fao.org/3/i3342e/i3342e.pdf>
- Food and Agriculture Organization of the United Nations. (2017). *Global initiative on food loss and waste*. Retrieved June 1, 2021 from <http://www.fao.org/3/i7657e/i7657e.pdf>
- Fusions. (2014). *Definitional Framework for Food Waste*. Retrieved June 1, 2021 from <https://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Definitional%20Framework%20for%20Food%20Waste%202014.pdf>
- Fusions. (2016). *Food waste quantification manual to monitor food waste amounts and progression*. Retrieved June 1, 2021 from <http://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Food%20Waste%20Quantification%20Manual.pdf>
- Government of the Republic of Lithuania. (2002). *519 Dėl valstybinio strateginio atliekų tvarkymo plano patvirtinimo*. Retrieved June 1, 2021 from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.164386/asr>
- GUS, Environmental protection 2020, statistical data, Warsaw 2021
- GUS, Environmental protection, statistical data, Warsaw 2005-2015
- Gustavsson, J., Cederberg, C., & Sonesson, U. (2011). *Global food losses and food waste: Extent, causes and prevention ; study conducted for the International Congress Save Food! at Interpack 2011, [16 - 17 May], Düsseldorf, Germany*. Food and Agriculture Organization of the United Nations. Retrieved June 1, 2021 from <http://www.fao.org/3/mb060e/mb060e.pdf>
- Hultman, J., & Corvellec, H. (2012). *The European Waste Hierarchy: From the Sociomateriality of Waste to a Politics of Consumption. Environment and Planning A: Economy and Space*, 44(10), 2413–2427. <https://doi.org/10.1068/a44668>
- Krämer, L. (2015). *EU Environmental Law*. Sweet & Maxwell/Thomson Reuters.
- LLWM. ‘Republic of Lithuania Law on Waste Management’. Retrieved June 1, 2021 from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.59267/asr>
- Lietuvos Respublikos Seimas. (2021). *Atliekų tvarkymo įstatymo Nr. VIII-787 pakeitimo ir papildymo projektas / Draft law on amendment and supplement to Waste Management Law no. VIII-787*. Retrieved June 1, 2021 from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAP/0c510170a75b11eb98ccba226c8a14d7?positionInSearchResults=1&searchModelUUID=392bfb98-79c2-4e3c-9cbb-93b35285de33>

Limba, T., Novikovas, A., Stankevičius, A., Andrulevičius, A., Tvaronavičienė, M. (2020). Big Data Manifestation in Municipal Waste Management and Cryptocurrency Sectors: Positive and Negative Implementation Factors. Sustainability. <https://doi.org/10.3390/su12072862>

Minister of environment of the Republic of Lithuania. (1999). *Dėl Atliekų tvarkymo taisyklių patvirtinimo*. Retrieved June 1, 2021 from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.84302/asr>

Møller, H., Hanssen, O. J., Gustavsson, J., Östergren, K., Stenmarck, Å., & Dekhtyar, P. (2014). *Report on review of (food) waste reporting methodology and practice*. Retrieved June 1, 2021 from <https://www.eu-fusions.org/index.php/download?download=7:report-on-review-of-food-waste-reporting-methodology-and-practice>

‘National Waste Management Plan 2022’. Regulation No 88 of 1 June 1016 on ‘National Waste Management Plan 2022’ (MP of 2016, Item 784)

Pearson D, Perera A. (2018) Reducing Food Waste: A Practitioner Guide Identifying Requirements for an Integrated Social Marketing Communication Campaign. *Social Marketing Quarterly*, 24(1), 45-57. doi:[10.1177/1524500417750830](https://doi.org/10.1177/1524500417750830)

Pinasseau, A., Zenger, B., Roth, J., Canova, M., & Roudier, S. (2018). Best Available Techniques (BAT) Reference Document for Waste treatment Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control). *EU Science Hub - European Commission*. <https://doi.org/10.2760/407967>

Pope, K. (2020). *Global Waste Management: Models for Tackling the International Waste Crisis* (1st edition). Kogan Page.

Post, Harry H. G. (2016). Legal Risks in European Environmental Law and Policy. Legal Risks in EU Law. Springer International Publishing. <https://doi.org/10.1007/978-3-319-28596-2>

PLW. ‘Act of 14 December of 2012 regarding waste’ (consolidated text ‘Law Journal of 2021’, Item 779)

PLCOM. ‘Act of 13 September 1996 regarding the maintenance of cleanliness and order in municipalities’ (consolidated text ‘Law Journal of 2021’, Item 888)

Sanchez Lopez, J., Patinha Caldeira, C., De Laurentiis, V., Sala, V., & Avraamides, M. (2020, August 14). *Brief on food waste in the European Union* [Text]. EU Science Hub - European Commission. Retrieved June 1, 2021 from <https://ec.europa.eu/jrc/en/publication/brief-food-waste-european-union>

de Sadeleer, N (2020). Environmental Principles. OUP Oxford. ISBN 978–0–19–884435–8

Scotford, E. (2008). The New Waste Directive—Trying to Do It All... An Early Assessment. *Environmental Law Review*, 11, 75–96. <https://doi.org/10.1350/enlr.2009.11.2.046>

Scotford, E. (2021). Legislation and the Stress of Environmental Problems. Current Legal Problems, Faculty of Laws University College London Law Research Paper No. 2/2021, Available at SSRN: <https://ssrn.com/abstract=3756907> or <https://dx.doi.org/10.2139/ssrn.3756907>

Sejm materials (2020), Justification for changes to the Waste Act of 2012. Retrieved June 1, 2021 from [http://orka.sejm.gov.pl/Druki9ka.nsf/Projekt/9-020-307-2020/\\$file/9-020-307-2020.pdf](http://orka.sejm.gov.pl/Druki9ka.nsf/Projekt/9-020-307-2020/$file/9-020-307-2020.pdf)

Stenmarck, Å., Jensen, C., Quedsted, T., Moates, G., Buksti, M., Cseh, B., Juul, S., Parry, A., Politano, A., Redlingshofer, B., Scherhauer, S., Silvennoinen, K., Soethoudt, H., Zübert, C., & Östergren, K. (2016). *Estimates of European food waste levels*. Retrieved June 1, 2021 from <http://edepot.wur.nl/378674>

The Council of Ministers (2021). List of legislative work and the programme of works. Retrieved June 1, 2021 from <https://archiwum.bip.kprm.gov.pl/kpr/form/25,Wykaz-prac-legislacyjnych-i-programowych-Rady-Ministrow.html>

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development* | Department of Economic and Social Affairs. Retrieved June 1, 2021 from <https://sdgs.un.org/2030agenda>

Van Ewijk, S., & Stegemann, J. A. (2016). Limitations of the waste hierarchy for achieving absolute reductions in material throughput. *Journal of Cleaner Production*, 132, 122–128. <https://doi.org/10.1016/j.jclepro.2014.11.051>

Zębek, E., Szejewska, M., Raczkowski, M. (2015). Legal and organisational solutions of municipal waste management in Poland in compliance with Waste Directive 2008/98/EC. *Journal of Environmental Protection and Ecology*, 16(2), 652-658.

Zębek, E. (2018). Waste management in legal and environmental terms, KPP Monografie, UWM Press, Olsztyn, pp. 371

ELŻBIETA ZĘBEK is a PhD, Assoc Prof at the University of Warmia and Mazury in Olsztyn, Poland (Faculty of Law and Administration, Department of International Public Law and European Union Law).

ORCID ID: <https://orcid.org/0000-0002-8637-8391>

LEDA ŽILINSKIENĖ is a PhD student at Mykolas Romeris University (Institute of Public Law at the Law School).

ORCID ID: <https://orcid.org/0000-0001-6297-4247>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:
@Entrepr69728810

Copyright © 2021 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access